UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/728,096	12/01/2000	Rajendra Kumar Bera	JA999-704	4541

30449 7590 04/10/2007 SCHMEISER, OLSEN & WATTS 22 CENTURY HILL DRIVE SUITE 302 LATHAM, NY 12110	**EXAMINER** VO, TED T

ART UNIT	PAPER NUMBER
2191	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/10/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

	Application No.	Applicant(s)
Office Action Summary	09/728,096	BERA, RAJENDRA KUMAR
	Examiner	Art Unit	
	Ted T. Vo	2191	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>22 January 2007</u>.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8,10-13 and 15-18* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8,10-13 and 15-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

1.   This action is in response to the amendment filed on 01/22/07.

Claims 1-8, 10-13, 15-18 are pending in the application.

Response to Arguments

2.   The arguments have been considered but they are not persuasive.

As admitted in the specification, particularly in the title "Determination of the Equivalence of Algebraic Expressions" and the descriptions therein, the speciation as a whole directs to a mathematical algorithm, i.e, it expresses the equivalences two mathematical expressions, as in the manner of:

$a \cdot (x\text{-}b) \rightarrow a \cdot x - b \cdot x$;

$((a+b)) \rightarrow a+b$;

$x^n \rightarrow x \cdot x \cdot ... \cdot x$ (n times); $x^{\text{-}n} \rightarrow x\_ \cdot x\_ \cdot ... \cdot x\_$ (n times, where $x\_$ is another expression of -x), and so on.

For determining the equivalence between two expressions, every student, from high school to college, knows how to perform based on "fundamental true", i.e. algebraic rules. It would be improper for claiming a fundamental true by adding subject matters of prior art for covering 101 issue, but the claims as a whole remains claiming "a fundamental true" of the nature.

In the specification, and used as claiming, the claim merely recites an algorithm based on the mathematical rules of the expressions, i.e, recasting, (i.e. $x^2 \rightarrow x \cdot x$); reducing (i.e. "2x +x" $\rightarrow$ 3x) comparing (i.e. $x^2 = x \cdot x$? or $x^2 = x \cdot x \cdot x$? A student will know correctly that $x^2 = x \cdot x$ and $x^2 =/= x \cdot x \cdot x$ for every x =/= 0 and 1). Performing an expression with an algorithm of recasting, reducing, and comparing does nothing but it uses the mathematical rules. Thus, if a claim is based on the above algorithms, it obeys the rules rather than an invention. Furthermore, the claims merely recited (in the

preamble) "the equivalence, if any, of two algebraic expressions for use in compiler optimization of source code...".

When a claim as a whole shows nothing, but preempts a math subject:

Court has addressed the issue of patentable subject matter several times. Gottschalk v. Benson, 409 U.S. 63 (1972); Parker v. Flook, 437 U.S. 584 (1978); Diamond v. Chakrabarty, 447 U.S. 303 (1980); Diamond v. Diehr, 450 U.S. 175 (1981). Since before the Civil War, this Court has consistently made it clear that subject matter which would have the practical effect of preempting a law of nature, mathematical formula, or abstract idea is ineligible for patent protection. O'Reilly v. Morse, 56 U.S. (15 How.) 62, 113 (1854); Benson, 409 U.S. at 71. This age-old and timetested precedent effectively establishes a penumbra of ineligibility for patent protection to safeguard the fundamental policy that laws of nature and abstract ideas be left unrestrained by patents.

To be eligible for patent protection, "[a] process itself, not merely the mathematical algorithm, must be new and useful."

Flook, 437 U.S. at 591; Funk Bros. Seed Co. v. Kalo Co., 333 U.S. 127, 130 (1948) ("He who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a discovery application of the law of nature to a new and useful end.").

This Court stated in Flook that

it is "incorrect [to] assume[] that if a process application implements a principle in some specific fashion, it automatically falls within the patentable subject matter of § 101." Id. at 593. This Court explained that such an assumption is based on an impermissibly narrow interpretation of its precedent, including specifically Benson, and is "untenable" because "[i]t would make the determination of patentable subject matter depend simply on the draftsman's art and would ill serve the principles underlying the prohibition against patents for 'ideas' or phenomena of nature." Id.

In Warmerdam, 33 F.3d at 1360, 31 USPQ2d at 1759, **"steps of locating' a medial axis, and creating' a bubble hierarchy . . . describe nothing more than the manipulation of basic mathematical constructs, the paradigmatic abstract idea'")**. **>The courts have also held that a claim may not preempt< ideas, laws of nature or natural phenomena. The concern over preemption was expressed as early as 1852. See Le Roy v. Tatham, 55 U.S. 156, 175 (1852).("A principle, in the abstract, is a fundamental truth; an original cause; a motive; these cannot be patented, as no one can claim in either of them an exclusive right.")

See Le Roy v. Tatham, 55 U.S. 156, 175 (1852) "A principle, in the abstract, is a fundamental truth; an original cause; a motive; these cannot be patented, as no one can claim in either of them an exclusive right."

The claims are merely the arrangement of mathematic symbols in an expression, and the Applicants' arguments show they are <u>seeking for protection on a fundamental truth</u> of the steps a to c. Applicants attempt adding compiling in the claims, but the compiling they added is nothing but prior arts.

If it is maintained that the claim is claiming compilation then "compiling said source code into object code" is done out there, public domain.

If it is maintained that "source code comprises two algebraic expressions", then it is a mere program per se and also belonged to public domain; a source program can have any type of instructions in it. Suppose claiming a program has a loop instruction or a subroutine call, then it is every improper. Functionality of a claim should be "what it does" rather than "what it is".

If it is maintained that "where the compiling is comprises the steps (a) to (c), then it, again, does nothing but preempts algebraic rules.

The descriptions in the specification represent only the subject matters of mathematics and using the mathematical rules. Adding with "compiling", the claims do nothing, but the claims, as a whole, merely preempt a mathematical subject; i.e. the claim merely includes the things like,

$a \cdot (x\text{-}b) \rightarrow a \cdot x - b \cdot x$;

$((a\text{+}b)) \rightarrow a\text{+}b$;

$x^n \rightarrow x \cdot x \cdot \ldots \cdot x$ (n times); $x^n \rightarrow x\_ \cdot x\_ \cdot \ldots \cdot x\_$ (n times, where $x\_$ is another expression of -x).

Merely including two expressions in the claims or in a program, it would not make the claims

novelty under 1.111.

Many court's rules have set forth clearly, A CLAIM THAT EFFECTIVELY COVERS ALL USES

OF A LAW OF NATURE OR ABSTRACT IDEA SHOULD BE <u>INELIGIBLE FOR PATENT PROTECTION</u>.

Claim Rejections - 35 USC § 103

3.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness

rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4.   Claims 1-8, 10-13, 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over the

rules of Algebra.

Given the broadest reasonable interpretation of followed claims in light of the specification.

<u>As per Claim 1</u>:

Official notice is taken that the Algebraic rules discloses the Claimed limitations:

The algebraic rules disclose,

A method of determining, in a computer environment, the equivalence, if any, of two algebraic

expressions for use in compiler optimisation of source code and like computing tasks, said method

comprising the steps of:

Algebra rules show (a): For example, take (a+b)(a-b), one expression and a^2-b^2, another expression, they

are equivalent and will be recasting into a form **a*a -a*b+a*b-b*b**, by using the known rules of algebra.

(a) recasting said expressions into a form of one or more token pairs arranged sequentially in a string,

each said token pair comprising an operator followed by an operand;

Algebra rules show (b): For example **a*a -a*b+a*b-b*b** is reduced by algebraic rules as **a*a-b*b**.

(b) reducing said strings in accordance with a set of predetermined simplifying rules;

Algebra rules show (c): For example (a+b)(a-b) = a*a-b*b; and a^2-b^2 is another expression of a*a-b*b. In fact (a+b)(a-b) equals to a^2-b^2, equals *to* a*a -a*b+a*b-b*b.

(c) comparing the reduced strings by matching, to detect equivalence of the two algebraic expressions.

With limitation,

(c1) **compiling said source code into object code,** *wherein said source code comprises said two algebraic expressions, and wherein said compiling comprises said recasting said reducing, and said comparing.,*

Official notice is also taken that compilation definition in general is to convert source code into object code because it is known in the art, and admitted by Applicants as known and is prior art.

Therefore, it would be obvious to an ordinary in the art to apply rules/notation of algebra to implement the claim, and it would be also obvious to an ordinary in the art to use compilation because it is common in the art, as Applicants already admitted.

As per Claim 2: Algebraic rules disclose,

The method of claim 1,

wherein the recasting step (a) is preceded by a preconditioning step comprising, in relation to said algebraic expressions, the following sub-steps according to whether a sub step applies: (da) deleting a space in the expression; (db) removing a bracket in the expression by expanding a bracketed sub-expressions; (dc) inserting a unitary operator at the start of the expression; (dd) recasting a power factor, being a variable being raised to a power in the expression, in an alternate form as one of: (dda) the power factor being expressed as the variable multiplied by itself as many times as the power, if the power is a positive integer; (ddb) the power factor being expressed as a reciprocal of the variable multiplied by itself as many times as an absolute value of the power, if the power is a negative integer; (ddc) the power factor being replaced by an appropriate function which can compute the power factor, if the power is not an integer; (de) recasting a constant in the expression in exponential format; (df) substituting a "+" operator in the expression by "+1*", a "1" being in exponential format, (dg) substituting a "-" operator in

the expression by "-1*", a "1" being in exponential format; and (dh) recasting a "division by a constant" in the expression as multiplication by a reciprocal of the constant, wherein said compiling comprises said preconditioning step.

The example of (a+b)(a-b) and a^2-b^2 recasting into a form **a*a -a*b+a*b-b*b**, meet claim 2 because the claim 2 preempts the rules of algebra.

For example, algebraic rules:

(da): "a+ b" or "a+b" are the same (space deleting);

(db): (a+b) and a+b are the same (bracket removing);

(dc): a and +a are the same (inserting);

(dd): a^2 or a*a are the same (power recasting), and the same as to sub (dda), (ddb), (ddc);

(de): 12 and $.12*10^2$ are the same;

Further addressed to (df), (dg) , and (dh); these limitations are also applied to algebraic rules.

<u>As per Claim 3</u>: Algebraic rules disclose Claim 3 because Claim 1 recites all rules of algebra (See rationale addressed in Claim 2), where Claim 3 recites as,

The method of claim 1, wherein the simplifying rules in step (b) comprise: (ba) arranging token pairs into subgroups; (bb) arranging operand tokens in an arranged subgroup in order; (bc) reducing the ordered operands by consolidating one or more constants and eliminating variables of opposite effect to form reduced subgroups; and (bd) consolidating one or more multiple instances of similar subgroups, to produce a reduced string.

<u>As per Claim 4</u>: Algebraic rules disclose Claim 4 because Claim 4 recites all rules of algebra (See rationale addressed in Claim 2), where Claim 4 recites as, The method of claim 1, wherein an algebraic expression whose equivalence is to be determined contains an aliased variable, said method comprising an additional sub-step of arranging an ordered list of aliases of the variable, and substituting a first alias in the ordered list for all instances of the aliased variable in the expression, wherein said compiling comprises said arranging an ordered list of aliases of the variable and said substituting a first alias in the order list.

<u>As per Claim 5</u>: Algebraic rules disclose Claim 5 because Claim 5 recites all rules of algebra (See rationale addressed in Claim 2), where Claim 5 recites as, *The method according to claim 1, wherein an algebraic expression whose equivalence is to be determined contains a function, said method comprising additional sub-steps of: reducing function arguments using the set of predetermined simplifying rules; and replacing the function by a tagged string, said string designating a function name, parameter types, and arguments, wherein the tag distinguishes the function name from a variable, wherein said compiling comprises said reducing function arguments and said replacing the function by a tagged string.*

<u>As per Claim 8</u>: Algebraic rules disclose Claim 8 because Claim 8 recites all rules of algebra (See rationale addressed in Claim 2).

<u>As per Claim 6</u>: Claim 6 recite an apparatus, which has functionality equivalent to Claim 1. See rationale addressed in Claim 1.

<u>As per Claims 10-13</u>: As further limitations from Claim 6, Algebraic rules disclose claims 10-13. See rationale addressed in Claim 2.

<u>As per Claim 7</u>: Claim 7 recites a computer program product, which has functionality equivalent to Claim 1. See rationale addressed in Claim 1.

<u>As per Claims 15-18</u>: As further limitations from Claim 7, Algebraic rules disclose claims 15-18. See rationale addressed in Claim 2.

Conclusion

5.   **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX

MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should

be directed to Ted T. Vo whose telephone number is (571) 272-3706. The examiner can normally be

reached on 8:00AM to 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wei Y. Zhen

can be reached on (571) 272-3708.

The facsimile number for the organization where this application or proceeding is assigned is the

Central Facsimile number **571-273-8300**.

Any inquiry of a general nature or relating to the status of this application should be directed to

the TC 2100 Group receptionist: 571-272-2100. Information regarding the status of an application may

be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR. Status information for

unpublished applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TTV
March 30, 2007

TED VO
PRIMARY EXAMINER
TECHNOLOGY CENTER 2100